The Galileo Mission at Jupiter - Fact Sheet

Jupiter is the giant of our solar system, 1400 times the volume of the Earth, and over half a billion kilometers (310 million miles) away. It is surrounded by a thin ring system made of dust-sized particles, has at least 16 moons, and its dense fluid core generates a powerful magnetic field. Italian astronomer Galileo Galilei pointed a telescope at Jupiter in 1610, and discovered its four largest moons, Io, Europa, Ganymede, and Callisto, encircling the planet. His realization that heavenly or celestial bodies orbited something besides the Earth revolutionized the thinking about how the solar system works.

Launched in 1989 on STS-34 (the Space Shuttle Atlantis) and arrived in 1995, the Galileo spacecraft now returns mankind's attention to Jupiter. A change in launch strategy resulting from the Challenger Space Shuttle accident caused a clever re-thinking of Galileo's route, using the gravity of Venus once and Earth twice to give the spacecraft enough energy to get to Jupiter. Along the way, Galileo took the first close-up images of an asteroid (Gaspra), and at Ida discovered the first known moon of an asteroid (Dactyl). Galileo was also uniquely positioned to image the crash of Comet Shoemaker-Levy 9 into Jupiter's atmosphere. Upon arrival, Galileo's probe penetrated Jupiter's atmosphere and returned a Jovian weather report on temperature, pressure, composition, winds, and lightning, while the orbiter began its two-year Orbital Tour. Despite a failed high-gain antenna and a fussy tape recorder, more than 70% of the original Prime Mission science objectives were accomplished.

Prime Mission Overview	**Oct. 18, 1989 - Dec. 7, 1997**
Launched:	Oct. 18, 1989: Space Shuttle Atlantis
Atmospheric Probe Released:	July 13, 1995
Arrival at Jupiter and Probe Penetration:	Dec. 7, 1995
Probe Data Lasted:	59 min: 200 km (124 mi) penetration depth
Prime Mission Orbital Tour:	Dec. 7, 1995 - Dec. 7, 1997: 11 orbits
Closest Approach:	261 km to Ganymede on Sept. 6, 1996
Total Distance Traveled:	4,044,600,000 km (2,511,700,000 mi)
Total Data Returned in Orbital Tour:	2.4 gigabits (orbiter), 3.5 megabits (probe)
Number of Images Returned in Orb. Tour:	1645

Orbital Tour Discovery Highlights

Jupiter's Storms and Rings. Using data from the Probe's plunge into the top cloud layers of Jupiter, and from the Orbiter's search for water, Galileo discovered that Jupiter has billowing thunderstorms many times larger than those on Earth. These storms result from the vertical circulation of water in the top layers, leaving large areas (such as the Probe entry site) where air descends and becomes dry like the Sahara desert, and others where water rises to form the thunderstorms. Galileo also found that Jupiter's rings are made of small dust grains that were blasted off the surface of Jupiter's 4 innermost satellites (Adrastea, Metis, Amalthea, and Thebe) by impacts of meteoroids.

Hot, Active Volcanoes on Io. Now considered the solar system's most active body, Io's volcanoes were first discovered by Voyager 1 in 1979, and result from 100 meter (328 ft) tides in its solid surface. By taking Io's temperature with Galileo's instruments, scientists now know that some of Io's volcanoes are hotter (1800°C (3240°F)) than Earth's. From this, scientists surmise that lava made of a silicate material rich in magnesium erupts from below Io's surface. Galileo has also spotted Arizona-sized changes on Io's surface that occurred within 5 months due to coating by volcanic debris, as well as longer-term changes since the Voyager flybys.

A Possible Ocean on Europa. Possessing more water than the total amount found on Earth, Europa appears to have had, in recent geologic history, a salty ocean underneath its icy cracked and frozen surface, as revealed in images from Galileo with resolutions as small as 26 meters (85 ft). Ice "rafts" the size of cities appear to have broken and drifted apart, a frozen "puddle" smooths over older cracks, warmer material bubbles up from below to blister the surface, evaporative-type salts are exposed, and a remarkable lack of craters show the surface to be relatively young. Heat to melt the ice below could come from Europa's exposure to tidal friction from the gravity of Jupiter—less severe, but as profound, as the similar effect on Io. Europa has a thin oxygen atmosphere and an ionosphere.

Ganymede's Own Magnetic Field. Internal tidal friction again causes surprising effects on the solar system's largest moon, Ganymede, revealed by Galileo to be the first moon known to have its own magnetic field. Perhaps from a slightly different orbit in its past, enough heat from tidal friction caused the separation of material inside Ganymede and the "stirring" of a molten core of iron or iron sulfide which generates Ganymede's magnetic field.

Does an Ocean Hide Beneath Callisto's Surface? The most surprising finding of all, there is evidence to support the existence of a subsurface ocean on Callisto. The ocean would have to be deep enough inside the moon that it does not affect the heavily cratered surface on top. Instead, the ocean may be "showing itself" indirectly, through the magnetic field it generates. This could come from electric flow in a salty ocean generated by Jupiter's strong magnetic field passing through it.